

## Резюмета на научни публикации

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приложени за участие в конкурс за академична длъжност доцент за нуждите на  
Аграрен факултет, Тракийски университет

съгласно Приложение 8.1.

(Критерии за оценяване на кандидати за получаване на научни степени и длъжности,  
Област 6. Аграрни науки и ветеринарна медицина, Професионално направление 6.3.  
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### **I. Резюме на книга на база защитен дисертационен труд за присъждане на образователна и научна степен „доктор“.**

#### **Резюме**

Книгата на база разработен дисертационен труд обхваща 80 стандартни страници. Онагледена е със 7 фигури и 3 таблици. Използвани са 251 литературни източника, от които 13 са на кирилица. Преобладаващата част на литературните източници са от последните 10 – 15 години. Разглежданият проблем е представен в 8 основни раздела, давайки пълна представа за основните аспекти при комфорта при кравите за мляко отглеждани при свободно боксова система. В книгата са представени количествените и качествените показатели за измерване на комфорта при кравите за мляко. Обяснени са широко използваните на запад индекси на комфорт, тяхната характеристика и начин на определяне. Застъпени са по-важните компоненти обуславящи микроклимата в животновъдните помещения като: температура на околната среда; влажност на околната среда; скорост на движение на въздуха. Изяснява се влиянието на широко употребяваният в практиката индекс, използван за определяне на топлинен стрес при кравите за мляко, а именно температурно-влажностният индекс. Показана е характеристиката и начина му на определяне. В книгата са представени някои технологични фактори влияещи върху комфорта при кравите за мляко като: дизайн и размери на индивидуалните боксове за почивка на кравите за мляко; заден ръб на бокса; наклон на основата на бокса; свободно пространство за движение в бокса; позиция на тилният ограничител; дължина на бокса до гръдният ограничител; обща дължина на бокса; ширина на бокса и разделителни прегради между боксовете. Не на последно място се изяснява въпроса за влиянието на постелята в индивидуалните боксове върху комфорта при крави за мляко. Разгледани са различни видове постеля (най-често използваните в практиката) как точно влияят върху комфорта при кравите за мляко.

### **II. Резюмета на статии и доклади, публикувани в научни издания, реферирани и индексирани в световноизвестни база данни с научна информация (в хронологичен ред).**

II.1. Penev, T., I. Marinov, ZH. Gergovska, J.I Mitev, TCH. Miteva, **D. Dimov**, R. Binev. 2017. Linear type traits for feet and legs, their relation to health traits connected with them, and with productive and reproductive traits in dairy cows. Bulgarian Journal of Agricultural Science, 23 (No 3), 467–475. ISSN номер: 1310-0351 (print); ISSN: 2534-983X (online) *SJR – 0,262 (2017)*.

## Резюме

The objective of the study was to estimate the correlations between linear type traits for feet and legs, and their relation with locomotion disorders and productive and reproductive traits in Holstein cows reared in Bulgaria. The study included 136 cows from four dairy farms of different regions of Bulgaria. In all farms, cows were year-round reared group in free stalls with individual boxes for rest. In the study 7 linear type traits for feet and legs and the trait heel depth were included. On cows also a lameness scoring on a scale of 1 to 4 was carried out. Phenotypic correlations between linear traits were low. In cows with wider and parallel placed rear legs a tendency to straighter hock (-0.20) was reported, which was associated with a steeper foot (-0.16) and flatter hocks (-0.18). Cows with thicker bones and steeper foot (0.24) had a deeper heel (-0.24). When selection for thinner bones and optimal foot angle is conducted, it would be likely the heel depth to decline. Cows with straighter hock (-0.16), lower foot angle (0.18), shallower heel (-0.25) and better locomotion (0.25) had higher milk yield for 305 days. The selection for higher milk yield will be associated with a tendency for unfavorable phenotypic deviations in the various linear traits for feet and legs, with the exception of bone structure and locomotion. Cows with more pronounced X-shaped rear legs rear view (-0.18), with flatter and dry hocks (0.16) and with thicker bones (-0.25) had longer interval from calving to first insemination. Cows with thicker bones had smaller number of inseminations for conception (0.20). The phenotypic correlations between clinical problems with feet and legs and linear traits were with low values (from -0.01 to 0.10). With the highest and negative value was the phenotypic correlation between linear trait locomotion and clinical problems with legs and feet (-0.37). Using only the linear traits for feet and legs to reduce the locomotive problems, without additional information about the various clinical problems with legs and feet will not have a considerable effect.

II.2. **D. Dimov**, I. Marinov, T. Penev, Ch. Miteva, Zh. Gergovska. 2017. Influence of temperature-humidity index on comfort indices in dairy cows. *Sylwan*, 161 (6): 68-85. ISSN номер: 0039-7660 *IF – 0,623 (2017); SJR – 0,259 (2017)*.

## Резюме

The study is conducted in three dairy cattle farms located in southern Bulgaria, in climatic zone with transitional continental climate. In all farms cows are reared in freestall barns. The influence of temperature humidity index (THI) and the indices of comfort - Cow Comfort Index (CCI), Stall Usage Index (SUI) and Stall Standing Index (SSI) is studied. In the regions of the three farms in the summer season values of THI - a daily average of over 75 are reported, which create conditions for the occurrence of heat stress in dairy cows. The regressions between THI and CCI and SUI are negative and statistically significant. Increasing the values of THI with 1 over 68 reduces the value of SUI with 1.41% and with 0.84% of CCI. When increasing the values of THI over 68 the number of lying cows is reduced, but the number of ones standing in the stalls does not increased significantly. Cows prefer to stay in other areas of the building where they conceivably feel better in a cooler place.

II.3. **D. Dimov**, Z. Gergovska, I. Marinov, Ch. Miteva, G. Kostadinova, T. Penev, R. Binev. 2017. Effect of stall surface temperature and bedding type on comfort indices in dairy cows. *Sylwan*, 161 (8): 2-16. ISSN номер: 0039-7660. *IF – 0,623 (2017); SJR – 0,259 (2017)*.

## **Резюме**

The study was performed in 3 dairy farms in different regions of South Bulgaria - Stara Zagora, Haskovo and Plovdiv district (South Bulgaria). In all three farms throughout the year. The cows were reared in semi-open free-stall dairy barns. The differences between the farms consisted in the flooring and bedding of stalls, namely: Farm 1—rubber mats and straw; Farm 2—rubber mats; Farm 3—compost and straw. The observations were made during the visits on farms twice monthly. Comfort indices at all farms five times per day from 10.00 AM, to 6.00 PM; from July 2014 to July 2015 were measured. The aim of the study was to determine the effect of surface temperature of stalls with different bedding materials on comfort indices in dairy cows. The increase in stall floor surface temperature greater than 20°C led to substantial decrease of the number of cows lying down in stalls about 40% of the cows, and hence, lowered the cow comfort index (CCI) and stall usage index (SUI) values. SUI actually tabulated, at 75%. The use of rubber mats for stalls, without additional bedding, resulted in an undesirable increase by 4.5°C in surface temperature of the stall, during the summer months. The floors only with rubber mats, the SUI values for all recorded temperatures were the lowest.

II.4. **D. Dimov**. 2019. Zoo-hygienic assessment of lighting in semi-open freestall barns for dairy cows. AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 11, No 1, pp 67 – 73. ISSN номер: 1313-8820 (print); ISSN: 1314-412X (online)

## **Резюме**

The aim of the present study was to perform a zoo-hygienic assessment of lighting (natural and artificial) in different technological zones (stalls, manure and feed alleys) in semi-open freestall barns for dairy cows. The survey was conducted over a period of one year in 3 production buildings from 3 cattle farms located in three different areas of Southern Bulgaria - Stara Zagora District, Haskovo District and Plovdiv District. The building's parameters were as follows: building No.1 - capacity 120 cows, 60.00/18.00/3.00m, 1080m<sup>2</sup>; building No.2 - capacity 120 cows, 66.00/18.00/3.00m, 1188m<sup>2</sup> and building No.3 - capacity 500 cows, 90.00/45.00/3.30m, 4050m<sup>2</sup>. The premises lighting was measured with two combined apparatuses (Lutron EM-9300SD, 0-20000 lux and PU 150, 0-100000 lux), twice a month at 10.00, 12.00, 14.00, 16.00 and 18.00h at a height of 1m from the floor of the three technology zones. Summarized for all buildings, the light level varies widely by buildings, by seasons, by hours of reporting and by technological zones with limit values between 1 and 9810 lux. In all barns the most intense was the light above the feed alleys, followed by stalls and manure alleys; by hours of reporting during the day the level of lighting above the three technological zones was higher at midday (12.00-14.00h) compared to morning (10.00h) and afternoon (18.00h). Buildings No.1 and No.2 with a smaller built-up area provide more intensive lighting over all technological zones throughout all seasons compared to building No.3 with bigger built-up area: from 7.34 to 13.8 times over stalls, from 3.22 to 5.62 times over manure alleys and from 2.79 to 8.00 times over feed alleys. In buildings No.1 and No.2 there were prerequisites at least 16 hours of day light (photoperiod) to be provided during summer, autumn and spring, while in the winter months up to 8.00am and after 6.00pm the used artificial lighting was with low intensity and cannot provide the recommended over 160 lux intensity of the light. In building No.3 during most of the day for all seasons, the level of lighting above stalls and manure alley where the animals stay the longest time, the lighting level was lower than 160 lux. The factors 'building', 'season' and 'hour of the day' had a statistically significant effect ( $P < 0.05$ - $0.001$ ) on the level of lighting in the three technological zones in the studied buildings. Of the

associated factors, only the combination 'season\*hour of reporting' had no significant effect on the lighting in the zones above the stalls and manure alleys.

II.5. **Dimov, D.**, Marinov, I., Penev, T., Miteva, Ch., & Gergovska, Zh. 2019. Animal hygienic assessment of air carbon dioxide concentration in semi-open freestall barns for dairy cows. Bulgarian Journal of Agricultural Science, 25(2), 354–362. ISSN номер: 1310-0351 (print); ISSN 2534-983X (online), *SJR – 0,191 (2019)*.

#### **Резюме**

The objective of this study was to determine the CO<sub>2</sub> concentration in the different animal service zones in semi-open freestall barns for dairy cows. The study was conducted in 3 dairy cattle farms, with production buildings with different capacities—two farms for 120 and one farm for 500 cows. The following microclimate parameters were monitored: temperature (°C), relative humidity (RH, %), temperature-humidity index (THI) and speed of airflow (SAF). The average CO<sub>2</sub> values in the three buildings surveyed ranged from 434.85 to 635.27 ppm, with a maximum deviation up to 2130 ppm. The highest CO<sub>2</sub> concentrations were recorded in the building with the largest capacity – 500 cows. In the building with a capacity of 120 cows, a trend for the lowest CO<sub>2</sub> levels and the least variation during the day was reported. In the summer the lowest CO<sub>2</sub> values in the air above the stalls – 515.9 ppm were reported and in the winter the highest – 626.2 ppm. Highest CO<sub>2</sub> values in the morning and afternoon were recorded in all investigated barns when the animal's locomotor activity was greatest associated with eating, drinking, and moving (other activities). The correlation between the temperature-humidity index (THI) values and the CO<sub>2</sub> values was significant and negative (-0.23). The lowest CO<sub>2</sub> concentrations were reported at THI values 68-72.

II.6. PENEV TONCHO, MARINOV IVAYLO, **DIMOV DIMO**, GERGOVSKA ZHIVKA, MITEVA CHONKA, MITEV JURII. 2019. Risk Factors for Hock Lesions Occurrence in Dairy Cows. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 67(2): 415–423. ISSN номер: 12118516, *SJR – 0.167 (2019)*

#### **Резюме**

The aim of the study was to investigate the risk factors for formation of hock lesions in dairy cattle farms with different housing system. The study included 508 Black-and-white Holstein-type cows from 14 dairy farms in different regions of Bulgaria. On cows a hock lesion assessment (scale 1 to 3) and body condition scoring (scale 1 to 5) were made. From the total number of cows, 231 cows (45.5 %) with score of 2 and 3 were reported, which clinical manifestation was from loss of hairs on the hock joint surface to swellings and wounds. A statistically significant effect of lactation period, body condition scores (BCS) and housing system on the hock assessment score was found. The least square means (LSM) for hock assessment score increased with the advancing of lactation period from 1.22 in cows to 60 days in milk (DIM) to 1.52 in cows after 120 DIM. The percentage of cows with BCS 3 and 3.5 was lower 1.5 to 2 times compared to cows with BCS 1.5. With the lowest mean hock assessment score (1.14), were the cows housed free group on a thick bedding. Tie-stall housing system occupied an intermediate position with respect to hock assessment, only 1.4 % of cows were with a score of 3. The highest percentage of cows with varying degrees of hock lesions were reported in free-stall housing system with using of rubber mats for stall floors,

75.5 % of the cows were with hock lesion assessment score 2 and 3. This percentage was slightly lower when small amounts of straw were placed on the rubber mats.

II.7. **DIMOV DIMO** and MARINOV IVAYLO. 2019. Comfort Indicators in Free-Stall Housing of Dairy Cows. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 67(4): 1099 – 1107. ISSN номер: 12118516, *SJR* – 0.167 (2019)

#### **Резюме**

In recent years the dairy farming massively went from tied to free housing of dairy cows, and more widely in conditions of Bulgaria the semi open free-stall barns housing system is applied. One of the main factors associated with cow comfort in this housing system are the dimensions and design of the individual stalls. Indicators for stall comfort can be postures of cows when using the – standing with four or two legs in the stall, standing or lying diagonally, lying back in the stall, and more, these postures can also greatly guide us on the specific design problems that make stalls uncomfortable for the animals. In uncomfortable stalls cows spend less time resting and more time standing on the concrete floor of the technological alleys. Comfort indices are quickly and easily applicable to assessing comfort when used in general practice. For their correct application, careful consideration should be given to factors that affect their values - farm activity schedule, time of reporting during the day, season of reporting, etc.

II.8. Marinov, I., **Dimov, D.** & Penev, T. 2019. Influence of some environmental and paratypical factors on the somatic cells count in milk in black-and-white cows. *Bulg. J. Agric. Sci.*, 25 (Suppl. 3), 103–108. ISSN номер: 1310-0351 (print); ISSN 2534-983X (online), *SJR* – 0,196 (2019).

#### **Резюме**

The aim of the present research was to study the influence of some environmental and paratypical factors on the somatic cells count (SCC) in milk in black-and-white dairy cows, Holstein-Friesian type. The survey included a total of 484 lactating cows from 8 cattle farms in Plovdiv region, Bulgaria, by using data from the monthly controls of their productive traits – a total of 3473 Test Day records. A statistically significant effect on the SCC in milk for Test Day of the factors herd, parity, calving season, month of Test Day recording and lactation stage was reported. In cows with larger number of parities, a higher SCC was reported compared to the younger ones. The highest was the SCC in cows at third parity (656.4 thousand/ml) and the lowest at first parity (263.9 thousand/ml). With the highest SCC were cows calved in summer (599.5 thousand/ml), and with the lowest – in winter (177.5 thousand/ml). SCC increased considerably in August and September (562.5 and 461.8 thousand/ml) and reached the highest values in October and November (806.4 and 910.9 thousand/ml). The lowest was the SCC during the winter months from December to February (from 104.8 to 151.6 thousand/ml). The highest SCC in milk was recorded in the first 90 days in milk (DIM) (from 800 to 700.0/ml). After this period, SCC was starting to decline, and after 200 DIM, values relative to normal udder health status of less than 200.0 thousand/ml were reached.

II.9. Toncho Penev, Nikolina Naydenova, **Dimo Dimov**, Ivaylo Marinov. 2020. Influence of Heat Stress and Some Related Physiological Indicators on the Content of Long-Chain Fatty Acid in the

Milk of Holstein-Friesian Cows. Veterinarija ir zootechnika; 77(99) 51-58. ISSN номер: 1392-2130 (Print); ISSN 2669-2511 (Online), *SJR – 0,146 (2020)*.

#### **Резюме**

The aim of the research was to study the effect of heat stress (HS) and associated changes in the rectal temperature and the respiratory rate on long-chain fatty acid (LCHFA) content in the milk of Holstein-Friesian cows. The study included 22 cows on different parities studied in two periods: under thermo-neutral environment conditions (May 2018) and under heat stress (August 2018). The fatty acid content of milk was determined using a chromatograph by the method of Rose-Gottlieb. It was found that HS in dairy cows leads to changes in the content of some LCHFAs (C17:0; C18:0; C18:2 and C18:3) in milk fat. Under conditions of moderate HS (temperature-humidity index over 79), a certain decrease in the content of C17:0 was reported, while in the other three LCHFAs, an increase in their content in milk fat was reported to varying degrees. The strongest effect of HS was reported on the content of C18:0, which was proportional to the levels of HS. With an increasing rectal temperature, an increase in the content of C18:0 was reported, the increase being most substantial at a rectal temperature above 39.5°C.

II.10. Penev, T., Katcarov, V., Szostak, B., **Dimov, D.** 2020. Evaluation of hardness, size and weight load of hooves in wild boars, aboriginal and domestic swine. SYLWAN, 164 (3): 88-99. ISSN номер: 0039-7660. *IF – 0,624 (2019); SJR – 0,315 (2020)*.

#### **Резюме**

This study evaluated the hardness, size and weight load of hooves in wild, aboriginal and domestic swine at the same live weight. The hardness of the hooves of the three swine kind was evaluated in four zones - wall (abaxial - outside), toe, white line and heel with a durometer type Shore A. The length and width of the hoof was measured with a caliper. The hoof area was determined by the formula for square area of ellipse in cm<sup>2</sup>. The weight load per unit area of the hooves was then calculated by the formula:  $N = T : S$ , where T was the weight of the animal (g) and S was the bearing surface area (cm<sup>2</sup>). Wild boars had the hardest hooves in the wall area: 100.00 Shore A units for front and 99.68 Shore A units for rear hooves, followed by aboriginal respectively 99.78 and 99.19 and for domestic swine 97.61 and 95.92. The hoof length in wild boars was 67.82 mm for the front and 65.23 mm for the rear hooves. In the case of aboriginal swine, the length was 62.53 mm for the front and 59.53 mm for the rear hooves and 49.59 mm and 49.36 mm respectively for the domestic swine. The weight load per unit area of the hoof was as follows: in wild boars - 906.65 g/cm<sup>2</sup>, in aboriginal swine - 981.93 g/cm<sup>2</sup> and in domestic swine - 1252.19 g/cm<sup>2</sup>. The hooves of domestic swine are softer than those of aboriginal and wild boars. The size of the hooves is the smallest in domestic swine, which is why they have the highest weight load per unit area.

II.11. Marinov, I., Valchev, V., **Dimov, D.**, Penev, T. 2020. Relation between first lactation milk yield and functional traits in dairy cows. Agronomy Research, 18(3), pp. 2127–2137. ISSN номер: 1406-894X. *SJR – 0,369 (2020)*.

#### **Резюме**

The aim of the study was to analyze the relationship between first lactation milk yield (FLMY) and age at first calving (AFC), longevity and productive life in dairy cows. The study covered 944

Holstein cows housed in 5 dairy cattle farms in Bulgaria. All cows from the five farms culled in the period 2012 - 2018 with FLMY data were included. The average AFC for all culled cows included in the study was relatively high for the Holstein-Friesian breed - 29.75 months. The average FLMY of the herds included in the study was 7,660.94 kg with significant herd variation from 5,899.09 kg to 8,646.0 kg. Significant effect of the herd ( $P < 0.001$ ), AFC and the associated effect of the herd and AFC ( $P < 0.05$ ) on the average FLMY were found. The highest FLMY was reported in primiparous with AFC of 28 30 months - 7,860.8 kg, and the lowest in those with AFC 24 months - 7322.8 kg. In the herd with the lowest average FLMY - 5,899.09 kg 27.5% of the heifers had calved at age over 34 months. A statistically significant effect of AFC ( $P < 0.001$ ) was found on longevity, whereas the productive life was significantly influenced by FLMY ( $P < 0.05$ ). A tendency for higher longevity for cows with higher AFC of 34 37 months and over 37 months 5.9 and 5.8 years, respectively was observed. The lowest were the longevity values for cows calved at age up to 24 months - 4.9 years. The cows with the lowest average FLMY (up to 4,000 kg) had the shortest productive. Both very low and high AFC were associated with lower first lactation cow productivity and shorter productive life. The losses for farmers were greater when keeping a high AFC in heifers, which increases the cost for housing them, and the lower productivity and longer productive life reduce the probability.

11.12. **Dimov, D.**, Marinov, I. & Penev, T. 2020. Risk working conditions in dairy cattle farming-a review. Bulg. J. Agric. Sci., 26 (Suppl. 1), 72-77. ISSN номер: 1310-0351 (print); ISSN 2534-983X (online), *SJR – 0,248 (2020)*

#### **Резюме**

Dairy production is one of the most difficult sectors of agriculture, in particular of animal husbandry. 87% of accidents at work in animal husbandry are caused by cattle. Dairy cattle farming work, especially milking, is physically difficult and involves awkward postures and moves. In the people involved in this activity, and in particular the daily milking of cows, it has been found that most of them complain of pain in the musculoskeletal system. In spite of the reported labor relief in the loose-housing dairy production systems where milking is carried out in a standing position, the workload among workers is localized in the upper limbs, resulting in the majority of them complaining of pain in the musculoskeletal system. Microclimate and lighting conditions are very important because they often are the basis for various occupational diseases. Not in all farms, natural and artificial light and microclimate are satisfactory. The level of illumination in the building under the conditions of tie-housing production system and in milking parlor is essential on the one hand for the normal course of milking as a process, and on the other hand it should not be forgotten that it is the production of raw material, which is basis of various food products. There are not a few cases in which workers in dairy cattle farms develop respiratory problems and diseases due to high level of dust in the air. Under the conditions of current animal husbandry, the noise becomes more and more large but less noticed problem. A number of studies have shown a strong decrease in hearing and even hearing loss even in farmers and longtime workers. Exposure not only to very high but also constant noise leads not only to reduced hearing, but also to the development of certain diseases, such as high blood pressure and other psychosomatic disorders. Extending and deepening studies of working conditions in dairy cattle farming can contribute to improving these conditions and reducing the unattractiveness of this profession.

II.13. **Dimov, D.**, Penev, T. & Marinov, I. 2020. Illumination levels in milking parlor in dairy cows freestall housing system. Bulg. J. Agric. Sci., 26 (Suppl. 1), 78-82. ISSN номер: 1310-0351 (print); ISSN 2534-983X (online), *SJR – 0,248 (2020)*

#### **Резюме**

The survey was conducted in the milking parlor of dairy cattle farm with a capacity of 500 Holstein-Friesian cows. Milking parlor was a double-8 “herringbone” type. The premises had no windows, and the roof structure was constructed of glass. The milking parlor lighting was of fluorescent luminaires. The illumination level was reported three times during each milking (at the beginning, in the middle and at the end of the milking), with the measurements repeated during the morning, midday and evening milking. The illumination level was measured at the level of the milkers' hands during work, using a Lutron EM-9300SD. The highest average value of illumination level was reported during the spring season for midday milking 1030.3 lux. The lowest reported average value of the illumination level was registered during the winter season at evening milking 80 lux. It was found that the reporting season and the sequential milking for the day had a statistically significant effect on the illumination level in the milking parlor.

II.14. **Dimov, D.**, Toncho Penev and Ivaylo Marinov. 2020. Temperature-humidity index – an indicator for prediction of heat stress in dairy cows. Veterinarija ir Zootechnika; 78(100):74-9. ISSN номер: 1392-2130 (Print); ISSN 2669-2511 (Online), *SJR – 0,146 (2020)*.

#### **Резюме**

The growing interest in the thermal comfort of dairy cows is justified, not only in countries located in tropical zones, but also in zones with temperate climate where high ambient temperatures are becoming a problem. The temperature-humidity index (THI) is a value representing the combined effect of air temperature and humidity associated with the level of heat stress. THI values lower than 72 mean that the cow's body is in favourable environmental conditions and is not subject to heat stress. At THI values of 75 to 78, the animal organism is under heat stress, but the mechanisms of thermoregulation still manage to cope, while at THI over 78 it is assumed that the stress is so high that it is impossible to maintain the thermoregulatory mechanisms or normal body temperature.

II.15. Penev, T., **D. Dimov**, N. Vasilev, J. Mitev, Tch. Miteva, I. Marinov, M. Stojnov. 2021. Influence of heat stress on reproductive performance in dairy cows and opportunities to reduce its effects – a review. AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 13, No 1, pp 3-11. ISSN номер: 1313-8820 (print); ISSN: 1314-412X (online)

#### **Резюме**

The goal of this review is to consider and discuss the scientific literature related to the effect of heat stress (HS) on reproductive performance in dairy cows and opportunities to reduce its effects. The information in literature shows that the HS topic in dairy cows began to be discussed in the 1970s. As genetic progress related to productivity increases, the requirements for cows also increase, including for their reproduction performance. In the present review, a significant array of scientific papers is examined, as a result of which it is established that HS has a multifaceted effect on reproduction in dairy cows. The main role for the negative impact of HS is the effect of



high ambient temperature on the hypothalamic-pituitary-ovarian axis. As a result, hormonal changes occur in the body of cows, which affect the behavior of cows in estrus, the development of follicles in the ovaries and the survival of the embryo in the uterus. These changes affect the main elements of cattle breeding such as length of days open interval, conception rate, number of inseminations required for conception. To mitigate the negative impact of HS on cows, methods have been developed for better estrus detection, for microclimate control, as well as for hormonal treatment of cows in order to increase reproductive performance. Although some progress has been made in each of the measures, HS still poses a serious reproductive problem for dairy cows, especially in the countries with warmer climates. This provokes the interest of many scientists around the world who seek to offer a solution/mitigation to this problem.

II.16. **Dimov, D.** and Marinov, I. 2021. Factors determining the choice of bedding for freestall housing system in dairy cows farming - A review. *Journal of Central European Agriculture*, 2021, 22(1), p.1-13. DOI: /10.5513/JCEA01/22.1.2778. ISSN номер: 1332-9049, ***SJR – 0,207 (2020)***.

#### **Резюме**

The subject of the study are the most commonly used bedding materials in freestall housing system in dairy cattle farming and the factors determining their choice. In recent years, in many countries as well as in Bulgaria there has been a tendency to change from small dairy cattle farms to larger ones by applying intensive farming systems. Many factors must be taken into account when developing appropriate interior design of dairy freestall barns. Among these factors is the providing of comfortable resting places with minimal risk of body injuries and bacterial infections. The bedding must meet many conditions: to be inexpensive, dry, not to support bacterial growth, not to contain pathogens, to be comfortable for cows to rest, and to be compatible with the manure cleaning system. Increased amounts of bedding have been shown to increase cow comfort by increasing the lying time, however controlling bacterial counts and udder health requires frequent removal of bedding material. The most widely used bedding materials in dairy cattle farming worldwide can be grouped into two main groups: organic - straw, hay (dried grass), sawdust, wood shavings, crop residues, composted manure and paper, and inorganic: sand, limestone, gypsum, rubber mats and mattresses, cement. When choosing bedding, first the comfort that it will provide to the animals must be considered, then whether the bedding will properly match the manure cleaning system and last but not least the price it will cost.

II.17. Penev, T., N. Naydenova, **D. Dimov** and I. Marinov. 2021. Influence of Heat Stress and Physiological Indicators Related to It on Health Lipid Indices in Milk of Holstein-Friesian Cows. *Journal of Oleo Science*, 70, (6) 745-755. doi: 10.5650/jos.ess20251. ***IF – 1,304 (2019); SJR – 0,394 (2020)***. ISSN номер: 1345-8957 (PRINT); ISSN: 1347-3352 (ONLINE)

#### **Резюме**

The aim of the survey was to study the effect of heat stress (HS) on health lipid indices in milk of Holstein-Friesian cows. The study was conducted in a cattle farm with Holstein-Friesian cows in the region of Karnobat (Southeastern Bulgaria) in 2018. Cows were housed in semi-open free stall dairy barn, fed year-round ad libitum with a total mixed ration. The study included 22 cows on different parities studied in two periods - at thermo-neutral environment conditions and at heat stress, respectively, May and August. Extraction of milk fat was performed by the Rose-Gottlieb method. Conditions of HS lead to changes in the values of health lipid indices associated with a decrease in the values of Atherogenic index (AI), Thrombogenic index (TI), Lipid Preventive

Score (LPS) and Desaturase (18) index (DI 18) and an increase in Health promoting Index (HPI), polyunsaturated fatty acids/saturated fatty acids (PUFA/SFA), unsaturated fatty acids/saturated fatty acids (UFA/SFA), mono unsaturated fatty acids (MUFA), Desaturase (16) index (DI 16) and hypocholesterolaemic/hypercholesterolaemic ratio (h/H). Increasing the Temperature-humidity index (THI) above 72, results in a decrease in the AI values and an increase in those of the PUFA/SFA. The values of health lipid indices showed a moderate positive correlation with those of THI (PUFA/SFA - 0.36) with rectal temperature (h/H, MUFA/SFA, UFA/SFA)  $r_p$  from 0.36 to 0.37, and with respiratory rate (h/H, PUFA/SFA),  $r_p$  of 0.33 and 0.31, respectively. Under the influence of heat stress, changes in the metabolic processes occur in the body of dairy cows leading to changes in the fatty acid content of milk related to the improvement of health lipid indices in terms of human health due to an increase in UFA and reduction in SFA.

II.18. Penev, T., **D. Dimov**, I. Marinov and T. Angelova. 2021. Study of influence of heat stress on some physiological and productive traits in Holstein-Friesian dairy cows. *Agronomy Research*, 19(1), pp. 210–223. <https://doi.org/10.15159/AR.21.014>, ISSN номер: 1406-894X, *SJR* – 0,369 (2020).

#### **Резюме**

The aim of the research was to study the effect of heat stress (HS) on some physiological and productive traits in Holstein-Friesian dairy cows. The study included 22 cows on different parities. In the building where the cows were housed, the temperature-humidity index (THI) was reported at 10:00 and 15:00 h, at the same time the rectal temperature (RT) and respiratory rate (RR) were reported for each of the examined cows. The daily rumen activity was taken from the SCR system by Allflex. The average THI values in May were 71, in June - 75, in July - 74, and in August - 77, from which it follows that in the summer months the cows were in conditions of mild to moderate heat stress throughout the day. The average daily milk yield of the cows increased from May to June and reached 41.44 kg day<sup>-1</sup>, then decreased in July and August to 37.2 and 32.48 kg day<sup>-1</sup>, respectively. With an increase in the THI values, an increase in the RR and RT was registered, as in THI above 79 the RR was 56.54 per min, and the RT was 39.33 °C. With increasing the THI values, the rumination of the cows decreased from 563 per day at THI < 72 to 542.5 at THI > 79. In cows with high daily milk yield, a higher RT was registered, and in cows with more than 50 kg per day, the RT was 39.09 °C. A more intense rumination was found in cows with higher daily milk yield. In cows with an average daily milk yield of 33.26 kg, an average of 450 ruminations per day were reported, and in those with an average milk yield of up to 42.89 kg - 650 ruminations per day. From the research conducted it was found that the studied physiological traits - rectal temperature, respiration rate and rumination are influenced by HS and the intensity of this effect depend on the daily milk yield of cows and THI levels.

II.19. **Dimov, D.**, Marinov, I., & Penev, T. 2021. Thermal Work Limit Index in Cattle Farm. *Acta Univ. Agric. Silv. Mendel. Brun.*, 69(2), 199-202. doi: 10.11118/actaun.2021.016. ISSN номер: 12118516, *SJR* – 0,179 (2020).

#### **Резюме**

The survey was conducted in workers in dairy farming in Bulgaria. In the survey were not reported Thermal Work Limit (TWL) index values, which require cessation of employment and constitute a danger to human health. The lowest values of TWL were registered during the summer and

spring months, respectively 229.3 and 258.4 W/m<sup>2</sup>. The highest are normally registered in the autumn and winter months – 318.3 and 312.2 W/m<sup>2</sup>. Outdoor the lowest average TWL values were reported in the summer and spring months 236 and 287.9 W/m<sup>2</sup>, respectively, and the highest in the autumn and winter months – 316.4 and 317.2 W/m<sup>2</sup>. An inverse dependency was found between the calculated values of Temperature–humidity index (THI) and the TWL.

### **III. Резюмета на статии и доклади, публикувани в нереферирани списания с научно рецензиране или публикувани в редактирани колективни томове (в хронологичен ред).**

III.1. Penev, T., V. Radev, T. Slavov, V. Kirov, **D. Dimov**, A. Atanasov, I. Marinov. 2014. Effect of lighting on the growth, development, behaviour, production and reproduction traits in dairy cows. *International Journal of Current Microbiology and Applied Sciences (IJCMAS)*, 3, (11) 798-810. ISSN номер: 2319-7692 (Print); ISSN: 2319-7706 (Online)

#### **Резюме**

Diurnal cycles and sunlight are essential for living beings on Earth. During their evolutionary development, many animal species have become capable to detect and react to changes in light intensity and photoperiod durations caused by seasonal changes, which influence their physiological state and dynamic stereotype. This is demonstrated in poultry reared in industrial production systems, where the egg production throughout the year is controlled via photoperiod alteration, in horse husbandry for prolonging or restarting the reproduction period, whereas in dairy cattle farming it is applied for increasing milk yield and disease resistance. With this regard, a number of researchers investigated the effect of light day duration and light intensity on factors associated with better economic results in dairy cattle farms. Light is one of primary components of microclimate of farm animal environment. Lighting of animal premises is essential for one of most important elements of animal welfare the contact with mates from the same species. The effects of lighting on animal morphology, physiology and behaviour have been described in the number of studies. The increased day length by artificial lighting during the winter caused earlier change of the winter with summer coat. So far, there are no reports showing a negative effect of coat change on the health of cows. Anyhow, the energy losses for body temperature maintenance related to the thinner coat during the winter should be taken into consideration. The problem was not yet elucidated, although important for the practice. Lighting intensity and duration are of great significance for health and life span of cows. According to the authors, cows prefer light over dark places. Probably, the better illumination and visual contact between cows contribute for social hierarchy build-up and prevention of traumatism. This fact has caused researchers and manufacturers of farm equipment to develop and implement technologies for best possible illumination and microclimate and thus, to provide optimal rearing conditions. Proper illumination of animal premises is important for both animal welfare and safe, healthy working conditions for farm personnel.